FAA-E-2580
December 7,1973

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION SPECIFICATION

1. SCOPE

1.1 Scope.- The equipment specified herein is a solid state line compensator-distribution amplifier assembly. This assembly accepts normal video, MTI video and beacon video; radar pretrigger, beacon pretrigger, and mode triggers; and azimuth change pulses (ACP) and azimuth reference pulses (ARP) from the radar transmitter site and provides line compensation, video amplification trigger separation, and signal distribution to the equipments requiring these inputs within the Terminal Radar Air Traffic Control facility.

2. APPLICABLE DOCUMENTS

2.1 FAA Specifications.- The following FAA Specifications, of the issues specified in the invitation for bids or request for proposals, form a part of this specification, and are applicable in their entirety unless otherwise specified.

FAA-G-2100/1	Electronic Equipment, General Requirements; Part 1, General Requirements for all Equipments
FAA-G-2100/3	Part 3. Requirements for Equipment Employing Semiconductor Devices
FAA-G-2100/4	Part 4. Requirements for Equipment Employing Printed Wiring Techniques
FAA-G-2100/5	Part 5. Requirements for Equipments Employing Microelectronic Devices
FAA-STD-012	Paint Systems for Equipment
FAA-STD-013	Quality Control Program Requirements

FAA-C-1217C	Electrical Work, Interior
FAA-E-163b	Rack, Cabinet and Open Frame Types
FAA-D-2494/1	Instruction Books Manuscripts, Technical; Equipment and Systems, Part 1, Preparation of Manuscript

2.2 Military publications.- The following publications, of the issues in effect on the date of the invitation for bids or request for proposals, form a part of this specification and are applicable to the extent specified herein.

MIL-STD-275	Printed Circuit Wiring for Electronic Equipment
MIL-STD-785	Requirements for Reliability Programs for Systems and Equipments
MIL-STD-756A	Reliability Prediction
MIL-STD-781B	Test Levels and Accept/Reject Criteria for Reliability of Non-Expendable Electronic Equipment
MIL-STD-17555	Electronic and Electrical Equipment and Associated Repair Parts, Preparation for Delivery of
MIL-STD-470	Maintainability Program Requirements for Systems and Equipments
MIL-HDBK-217A	Reliability, Stress and Failure Rate Data for Electronic Equipment
MIL-STD-461	Electromagnetic Interference Characteristics, Requirement for Equipments

3. REQUIREMENTS

3.1 Equipment to be furnished by the contractor.- The contractor shall provide completely assembled line compensator/distribution amplifiers and shall provide all the cable connectors and hardware required for their installation. A list of major subassemblies appears below. The paragraph describing each subassembly is noted in parentheses following each subassembly listed. Figure 1 shows functionally a block diagram of the LCDA.

(a) Video amplifier (3.4.2)

(b) Trigger amplifier (3.4.3)

(c) ACP and ARP amplifiers (3.4.4)

(d) Power supplies (3.4.6)

(e) Switching module (3.4.5)

3.2 Definitions.-

3.2.1 Terms for reliability.- Definitions relating to reliability shall be as defined in MIL-STD-785 and subordinate specifications.

3.2.2 Other definitions.- Definitions for electrical terms shall be as specified in FAA-G-2100- 1/3/4/5 and FAA-STD-013.

3.3 General requirements.- The contractor shall provide all necessary services and materials to design, develop, fabricate, test and deliver the line compensator/distribution amplifier assemblies as required by this specification in the quantities and at times required by the contract schedule. Any feature or item necessary for proper operation in accordance with the requirements specified shall be incorporated, even though that item or feature may not be specifically described herein. In addition, the contractor shall provide the necessary services to prepare the documentation specified herein.

3.4 Functional requirements.- The line compensator distribution amplifier (LCDA) assembly shall be totally redundant (both sides energized). The equipment comprising the LCDA shall be contained in a single panel capable of being mounted in a cabinet built to specification FAA-E-163b. Access to the components shall be from the front only. All modules in the LCDA shall be capable of being removed without disruption or changes to the output characteristics (amplitude phase, linearity, etc.) of the redundant module. When switching output signals, the redundant side not "on line" shall remain terminated in the characteristics impedance of the line. It shall be possible to combine the output video and trigger signals in one bus (beacon video/beacon triggers, beacon pretrigger/mode triggers, etc.) without degrading the signals or damaging the circuits in the LCDA. All data switching shall be done by means of solid state circuits. Relays shall not be used in any data circuits in the LCDA except by prior approval from the Government.

3.4.1 Input circuit characteristics.- The input circuits shall bridge the input lines at high impedance. Provisions shall be made to terminate each input line in its characteristic impedance at either of the redundant amplifiers connected to each input signal. The redundant amplifiers shall be configured in such a way that by the use of patch cords, the individual amplifiers comprising a redundant pair can be operated independently.

3.4.2 Video Amplifiers.- (Refer to Figure 2) Each video amplifier shall consist of an input buffer section, a line compensating section and an output section.

The input buffer section shall bridge the input line at high impedance, and shall prevent impedance changes, due to adjustments of the line compensator, from being reflected into the input line. The buffer amplifier shall have the necessary gain to compensate for the losses in the compensation networks. The video amplifier shall accept the signals specified below, and also the signals specified in 3.4.3.

The line compensator shall be capable of compensating for any length of RG-13 AU cable from 0 feet to 12,000 feet. The fidelity and recovery characteristics of the compensating circuits shall be such that, after proper phase and amplitude adjustment of the compensator, the output of the video amplifier faithfully reproduces the video at the input of the length of cable being compensated.

The output section shall accept the compensated video or mixed video and triggers. The output section shall consist of three separate video circuits, each one capable of being adjusted in amplitude independently from the remaining two circuits.

In addition, the output section shall include a trigger separator circuit. If trigger signals are mixed with the video signal, the output section shall separate the triggers from the video outputs, attenuating the triggers, a minimum of 6db below the level of the video at the video output.

An adjustable amplitude threshold level shall be provided in the trigger separator circuits to adjust the level at which the trigger can be detected above the video level.

The trigger separator output signal shall have the characteristics necessary to interface directly with the input of the trigger amplifier specified in 3.4.3.

The video signal characteristics are specified below.

		INPUT	OUTPUT
(a)	common mode rejection	100 dB	
(b)	impedance	Greater than 750 kilo ohms in parallel with 45 PF	75 ohms
(c)	noise and hum	input terminated in 75 ohms	0.010 volts

		INPUT	OUTPUT
(d)	rise time	0.05 us or greater	0.08 us for 0.05 us input
(e)	droop	500 us square pulse	Less than 10%
(f)	amplitude	0.25 to 6 volts	0 to 6 volts adjustable
(g)	gain		6 volts output for 0.25 input pulse, when terminated into a 75 ohm
(h)	overshoot	For 0.05 us rise time	Less than 10%
(i)	undershoot	For 0.05 us decay time	Less than 10%
(j)	linearity	The output level shall be linear within 1.0% of the applied input level irrespective of pulse width and gain	
(k)	pulse width	0.1 us minimum	Same as input
(l)	polarity	positive	positive
(m)	DC level		Less than 0.05 volts

3.4.2.1 Redundant video amplifiers.- The LC/DA shall include redundant (two each) video amplifiers for each of the following inputs:

(a) Beacon video or combined beacon triggers/beacon video.

(b) Normal video or combined radar pretrigger and normal video.

(c) Spare #1.

(d) Spare #2.

3.4.3 Trigger amplifiers.- Each trigger amplifier shall consist of an input buffer section and an output section. The input section shall bridge the input line at high impedance, or shall connect directly to the trigger separator circuit of the corresponding video amplifier by wire straps or similar means. The buffer section shall include an input level control, and a threshold level control to adjust the point in the leading edge of the trigger waveform at which the trigger amplifier will recognize the input signal as a trigger.

The output section shall accept the triggers from the buffer and shall provide three separate and independently adjustable outputs to the switching module specified in 3.4.5.

The trigger amplifiers shall be protected against high voltage transients (up to 500 volts).

The trigger amplifiers shall have the following electrical characteristics.

		INPUT	OUTPUT
(a)	amplitude	5 to 75 volts	0 to 50 volts adjustable. Measured at the switch output, terminated in 75 ohms.
(b)	rise time	Less than 0.2 us	Less than 0.01 us
(c)	decay time	Less than 0.6 us	Less than 0.1 us
(d)	jitter		Less than 0.01 us
(e)	pulse width	Less than 3 us	1.0 us $\pm$ 0.2 us
(f)	waveshape		Approximately a square pulse
(g)	overshoot	N/A	Less than 10%
(h)	undershoot	N/A	Less than 10%
(i)	impedance	750 kilo ohms parallel with 45 PF	75 ohms nominal
(j)	polarity	positive	positive
(k)	delay		1 us maximum with respect to the input

3.4.3.1 Redundant trigger amplifiers.- Redundant trigger amplifiers (2 each) shall be provided for each of the following input signals:

(a) Radar trigger

(b) Beacon trigger

(c) Mode triggers

(d) Spare

3.4.4 ACP and ARP amplifiers.- Each azimuth change pulse (ACP) and each azimuth reference pulse (ARP) amplifier shall be capable of accepting at any one time either type of ACP and ARP signals specified in 3.4.4.3 and

shall provide three (3) separate and independently controlled output sections. Each output section shall be capable of providing, at any one time and independently of the other sections, either of the types of output signals specified in 3.4.4.4. Reconfiguration from one type of input to the other, or one type of output to the other shall be possible by use of wire straps or similar means.

3.4.4.1 ARP monitor circuit.- Each ARP amplifier shall include a circuit to monitor the ACP count, and allow the transfer of ARPs to the output only after a determined number of ACPs have occurred from the previous ARP time. The ACP count shall be adjustable from 4000 to 4096 ACPs in 2 ACP increments. A gate shall open by the selected ACP count decode and shall be reset by the trailing edge of the ARP pulse or, if no ARP pulse is detected, shall be reset after a determined number of ACPs have occurred after the 4096 count. The ACP count decode necessary to reset the gate shall be adjustable from 0-16 ACPs in 2 ACP increments. Spurious noise falling outside the gate shall be excluded from the ARP output. If the ARP is missing from the output, the gate shall remain open until the next ARP resets it. When the circuit fails to detect an ARP within a 8192 ACP count, the gate shall be automatically bypassed and the input ARPs shall be routed to the output circuits. An amber light shall indicate the "bypass mode." During the bypass mode of operation, the monitor circuit shall monitor the input ARP line and if no ARPs are detected with 4 consecutive ARP times, an alarm shall be initiated. A red indicator light shall show this failure mode. In addition, a connection for external monitoring of the alarm shall be provided. The "alarm" condition shall be equal to logic level 1 and "no alarm" condition shall be equal to logic level 0. The external alarm interface shall be isolated and protected so no damage may be incurred to the equipment in case of erroneous connection to external equipment.

3.4.4.2 Redundant ACP and ARP amplifiers.- Redundant ACP and ARP amplifiers shall be provided for each of the following input signals:

(a) ACP

(b) ARP

(c) Spare ACP

(d) Spare ARP

3.4.4.3 Input ACP and ARP pulse characteristics.- The ACP/ARP amplifier shall accept the ACPs and ARPs of both type shown below. The input impedance of each module shall be 750 kilo ohms in parallel with 45 pF.

		Type I	Type II
(a)	amplitude	0 to 10 volts	0 to 10 volts
(b)	pulse shape	quasi sinosoidal	0.5 to 600 us rectangular positive pulse

		Type I	Type II
(c)	impedance	600 ohms, balanced	75 ohms, unbalanced
(d)	rise time	N/A	less than 0.2 us
(e)	decay time	N/A	less than 0.2 us
(f)	common mode noise rejection	50 dB	N/A

3.4.4.4 ACP/ARP output pulse characteristics.- Each output section of the ACP and ARP amplifiers shall provide ACP and ARP signals of the type specified below, depending on the type of output selected:

		Type I	Type II
(a)	amplitude	0 to 10 volts adjustable	0 to 10 volts adjustable
(b)	pulse shape	quasi sinusoidal	adjustable in width 0 to 28 us positive rectangular pulse
(c)	rise time	N/A	less than 0.2 us
(d)	decay time	N/A	less than 0.2 us
(e)	impedance	600 ohms, balanced	75 ohms unbalanced
(f)	common mode noise rejection	50 dB	N/A

3.4.5 Switching module.- (Refer to Figure 3) A switching module shall be provided for switching to either output side of the redundant amplifiers. All switching shall be done by means of solid state circuits.

The switching module shall include a local-remote switch. This switch shall determine which location shall have control over switching.

Switching shall be possible either from a "local" position in the switching module, or from a remote position.

When the "local-remote" switch is in the local position, each signal shall be switched independently by individual switches installed in an accessible place in the switching module.

When the "local-remote" switch is in the "remote" position, one switch (to be provided by others) shall switch all signals simultaneously. Interface points shall be provided in the LCDA for a single pole, single throw 1 amp. resistive switch. The design of the switching module shall include the power requirements for switching and monitoring

at the remote site. The remote monitoring indicators (provided by others) shall consist of 3 indicator lights, two showing which side of the LCDA is "on-line," and the third indicating the condition of "no-control" when the "Local-Remote" switch is in the local position. Interface points shall be provided in the LCDA for interconnection with the remote indicator lights. The remote indicator interface shall be 14 volts, 1 ampere per indicator light.

Indicators shall be provided in the LCDA to duplicate the indications of the remote indicator lights, except the "no-control" indication.

3.4.6 Power supplies.- Redundant power supplies shall be used. Each power supply shall have the capability and shall automatically power both sides of the redundant circuits, in case of the failure or removal of its sister power supply. In addition, it shall be possible to separate the output of each power supply and power each side of the redundant LCDA independently with its own power supply. This capability shall be provided by means of switches or accessible straps. Alarm circuits and indicator lights shall be provided to detect and monitor the performance of each of the power supplies. Means shall be provided in the LCDA for manually turning each power supply "on" or "off" for maintenance purposes. Both sides of the redundant LCDA shall be protected in such a manner that a short circuit on either side of the LCDA shall not affect the operation on the other side.

All power supplies shall be self-protecting such that without the use of fuses, circuit breakers or other protective devices, a continuous short across each power supply output will not damage circuit components and the output voltage will return to normal within 10 seconds upon removal of the short circuit. Each side of the redundant LCDA shall be provided with its own and separate AC input power connection, capable of being connected to a dedicated 120 Volts, 15 A. branch circuit.

3.4.6.1 Regulation.- All power supplies (except as approved by the Government) shall be electronically regulated to maintain output voltage to within ± 1% of the nominal value as the load is varied from 30% less than to 40% more than the normal load, and as the line voltage is varied between the service condition limits. The output voltage of regulated supplies shall be continuously variable over a minimum range of ± 10% of the nominal value, and the regulation and ripple specifications shall be met for any value of the output voltage within its adjustment range. Power supply output voltage shall not vary by more than ± 1% from the initial setting during operation over the service conditions. Each regulated power supply shall employ its own separate voltage reference device, and shall not rely upon another power supply for a voltage reference.

3.4.6.2 Ripple voltages.- Ripple voltages, defined as the peak-to-peak value of a simple or complex waveform consisting of power line frequency components and harmonics thereof, and synchronous or repetitive nonsynchronous transients, and noise shall not exceed .01% of rated output voltage for all electronically regulated power supplies. The ripple voltage of all power supplies shall be such that all specification requirements are fulfilled and further reduction of the ripple voltage would not result in any significant improvement in the stability of operation, circuit control adjustments, or equipment operation.

3.4.6.3 Line voltage regulators.- Line voltage regulators shall not be used as a means of meeting the system performance requirements under service conditions.

3.5 Reliability and maintainability requirements.- The contractor shall conduct reliability and maintainability programs in accordance with MIL-STD-785 and MIL-STD-470.

3.5.1 Reliability.- The minimum acceptable mean time between failure (MTBF) θ_1 as described in MIL-STD-781B shall be 2500 hours per simplex (including the switching module) under the operating and environmental conditions specified herein. In addition, the probability of successful simplex switching shall be .99 minimum. A failure is defined as non-compliance with any of the functional requirements specified herein. Prior to the final design of the system, the contractor shall submit MTBF calculations based on the prediction methods given in MIL-STD-756A and MIL-HDBK-217A.

3.5.2 Maintainability.- The maintainability design criteria shall be in accordance with MIL-STD-470. The mean corrective maintenance time (M_{ct}) shall not exceed 0.5 hours and the maximum corrective maintenance time (M_{maxct}) shall not exceed 2.0 hours (95th percentile) per simplex (including the switching module). Corrective maintenance shall include fault isolation, repair, and verification.

3.5.3 Part failure analysis.- All parts returned to the contractor during the contract warranty period shall be analyzed to determine the cause of failure. The analysis shall pinpoint the circuit board component that

failed, such as an integrated circuit chip or resistor, and the contractor shall provide detailed description of the failure mode, determined by actual laboratory analysis of the failed part. The contractor shall submit a report containing the results of each failure analyses within 30 days of receipt of the failed part.

3.6 Radio frequency interference.- The equipment shall meet the requirements of MIL-STD-461 Class 1C from 30 Hz to 300 MHz.

3.7 Protection circuitry.- Circuitry shall be incorporated to prevent damage to any part in the equipment due to momentary loss in input power or switching from commercial power to standby generator. Upon change-over, equipment shall return to normal operation.

3.7.1 Surge protection.- Protective devices shall be provided as necessary to prevent damage to the equipment from surges on either the AC power lines, the remoting lines, or both. The protective devices shall be capable of limiting initial spikes as might result from nearby lightning strikes to a value that will not damage any equipment. The protective devices shall be capable of withstanding repeated surges without damage or change in operating characteristics. This requirement is in addition to the surge protection specified in FAA-G-2100/1.

3.8 Construction.

3.8.1 Rack mounting.- The line compensator distribution amplifier assembly shall be designed to be rack mounted so that the complete assembly, connected for normal operation, can be installed in a Type I cabinet rack as described and illustrated in FAA-E-163. The chassis shall be fabricated from aluminum material, per FAA-G-2100.

3.8.2 Ventilation and cooling.- The LCDA shall meet the reliability and environmental requirements specified in this specification, when operating mounted in a rack as specified in 3.8.1, without resorting to the use of forced air ventilation.

3.8.3 Packaging.- The basic packaging concept of the equipment shall be modular plug-in cards or small plug-in assemblies. This does not relieve any other requirements, e.g., RFI integrity, operation under environmental conditions, reliability, system performance, system capability, functional capability, etc. It is realized that portions of the system are not amendable to this type of modular construction. Chassis/panel layout and modular configuration shall be subject to Government approval. The printed circuit cards shall be in accordance with FAA-G-2100/4. Printed wiring shall be in accordance with FAA-G-2100/4 and MIL-STD-275.

3.8.3.1 Printed-circuit board supports.- All boards shall be supported within one inch of the edge on at least two edges not including the edge with the connector. Support shall be provided to prevent fracture or loosening of the foil due to flexing the board.

3.8.3.2 Printed-circuit board connectors.- The printed-circuit board connector receptacles shall contain a polarizing key and the key location or form shall be different for each different type of printed-circuit board. All boards of the same type shall have the same polarizing key location or form to insure insertion of the proper type board. In addition, it shall not be possible to insert the PCBs the wrong way when using the extender specified in 3.8.3.4.

3.8.3.3 Printed-circuit board removal.- All printed-circuit boards shall include a convenient means for aiding maintenance personnel in grasping the board for removal from the mounting. This may consist of a special handle, cutout reinforced for finger holds or similar means. A special removal tool shall not be required. The method used by the contractor shall permit easy removal of the board without damage or undue strain of the board or any component mounted thereon.

3.8.3.4 Printed-circuit board extender.- With each equipment, there shall be supplied a printed-circuit board "extender." An extender consists of a printed-circuit board (not keyed in order to permit insertion into any connector) provided with printed circuitry to extend all plug input points across the board to a receptacle on the opposite end, into which receptacle a removed printed-circuit board can be plugged. The extender board thus provides an accessible active operating position for any printed-circuit board normally inaccessible for ready maintenance and test while within the card cage. The extender shall be furnished with each unit installed in a spare blank printed-circuit board receptacle position provided for that purpose.

3.9 Test points.- Test points shall be provided for measurement and observation of all voltages and waveforms needed for checking performance and for maintenance of individual units. Test points necessary for frequent alignment and adjustment purposes shall be provided on the plug-in cards and modules and shall be accessible without a card extender. Test points for waveforms shall be provided with jacks suitable for use with oscilloscope test leads. Tip jacks shall be provided for the measurement of voltages. All test points shall be identified with a TP number, and a voltage value, signal waveform or descriptive title (if voltage value or waveform would not be particularly significant) shall be indicated adjacent thereto, as well as on each schematic diagram. The equipment shall be designed to provide for connections for such test equipment as may be required for its expeditious maintenance, calibration and repair. All test points shall be readily accessible with adequate clearance and visibility when plug-in extension units are in position. Connection of normally used test equipment to any test point shall in no way affect system performance. Test points shall be identified by color as well as being labeled--red (positive voltage), violet (negative voltage), black (ground) and green (signal test points).

3.10 Service conditions.- The equipment shall meet the following service conditions.

3.10.1 Ambient conditions.- The equipment shall meet the requirements specified for environment I in paragraph 1-3.2.23 of FAA-G-2100/1.

3.10.2 Design center value for temperature and power.- The design center value for temperature shall be + 30°C. The design center value for AC line voltage shall be 120 V 60 Hz.

3.11 Parts requirements.

3.11.1 Integrated circuits, transistor and other semiconductor devices.- Equipment design shall be such as to utilize solid-state devices throughout in accordance with FAA-G-2100/3 and FAA-G-2100/5.

3.11.2 Controls.- All circuits shall be so designed that no damage will occur when the equipment is operated with the maintenance adjustments set to any possible configuration of settings. No fuses shall blow with actuation of any controls. There shall be no noticeable lag between the actuation or adjustment of controls and the effect of the actuation or adjustment.

3.11.2.1 Location of controls.- Frequently used controls on plug-in modules shall be accessible without removal of the module from its normal operating position. Controls on units using vertical panel construction shall be on the front surface of the panel of the module with which the control is associated. Controls for horizontal chassis units shall be mounted in front panels or immediately behind front access panel doors.

3.11.3 Grounding.- The grounding design must be compatible with other equipment with which this equipment may interface. The grounding design shall contain three discrete ground busses:

(a) One that connects to the equipment chassis.

(b) One that connects all signal return wires together.

(c) One that connects all power grounds together.

The cabinet/frames (a) and the signal return (b) ground busses shall be isolated from the power ground (c) and also isolated from building (earth) ground except that both busses (a) and (b) are to be connected to the building ground at one common connection point. Signal return paths for signals shall use the shield of the coaxial cable, or a separate signal return wire shall be provided for each path if coaxial cable is not required. The power grounding system (c) shall be separate from the other two busses.

3.12 Special tools for maintenance.- Tools necessary for repair, adjustment, or maintenance, not appearing in GSA Catalog, Part III, Hand Tools, shall be supplied with each equipment.

3.13 Instruction books.- Instruction books shall be in accordance with FAA-D-2494/1 and shall be furnished in the quantity specified in the contract schedule.

3.13.1 Printed Circuit Board Documentation.- The contractor shall provide logic documentation and art work for each type printed circuit board incorporated in the product.

4.0 Quality assurance provisions.

4.1 General.- The quality assurance provided by the contractor shall meet the requirements of FAA-G-2100 and FAA-STD-013, as amplified herein. The contractor shall provide the test facilities, instrumentation and services required to perform the tests specified herein. Original test data and records of examinations and inspections shall be kept complete and available to the Government for review. The tests shall be conducted by the contractor to demonstrate compliance with the specification according to the tests, methods and procedures in the Government approved test plan. The contractor shall furnish the test plans and procedures for Government approval 60 days prior to start of testing. These shall detail the time and manner in which the equipment shall be tested. The tests and procedures, as a minimum, shall consist of the following:

(a) Quality control and incoming inspection procedures

(b) Preliminary tests

(c) Design qualification test

(d) Type tests

(e) Production tests

(f) Factory acceptance tests

(g) Reliability maintainability demonstration tests

The Government reserves the right to witness or perform any additional testing deemed necessary to verify that the equipments conform with the requirements specified herein. The tests specified in (a), (b), (e) and (f) shall be conducted on each LCDA procured under this specification. Tests specified in (c), (d) and (g) shall be conducted on the first LCDA to be delivered by the contractor. Test (d) shall be performed as required by FAA-G-2100. Modifications to equipments generated as a result of any tests shall be incorporated into each and all LCDAs delivered at no additional cost to the Government.

4.2 Test conditions.

4.2.1 Environment.- Unless otherwise specified, tests shall be conducted at an ambient temperature of $30^{o}C \pm 10^{o}$.

4.2.2 Test power.- Equipment under test, shall be furnished with prime power which meets the requirements specified in 3.10.2.

4.3 Factory tests and inspections.

4.3.1 Quality control.- The contractor shall provide and maintain a quality control program in accordance with FAA-STD-013. The plan shall be submitted to the Government for approval within 45 days after award of contract.

4.3.2 Incoming inspection.- The Government may elect to make an incoming inspection of all or any portion of the parts and materials used in the construction of the equipment to assure compliance with paragraph 1-4.3.2.1 and 1-4.5 of FAA-G-2100. Acceptance of the parts and materials will not constitute final acceptance or approval of the specific uses in the equipment.

4.3.3 Preliminary tests.- Contractor's preliminary tests specified in FAA-G-2100/1 shall be performed on the first production equipment.

4.3.4 Design qualification tests.- In addition to the tests specified in FAA-G-2100/1, the design qualification tests shall include the verification of this specification requirements. RFI testing (Par. 3.6) shall be performed as part of the design qualification tests.

4.3.5 Type tests.- Type tests shall be performed on the first production LCDA and other LCDAs selected by the Government, in accordance with FAA-G-2100/1. These tests shall demonstrate compliance with all the requirements of this specification.

4.3.5.1 Environmental conditions.- The type tests shall be performed under the service conditions described in paragraph 3.10 while subjecting the LCDA to the temperature and humidity test procedures designated as Steps 1 through 8, specified in 1-4.12 of FAA-G-2100/1 on only those equipments selected by the Government to be type tested. Line frequency shall be a nominal 60 Hz.

4.3.6 Production tests.- Production tests shall be performed for each complete LCDA to be delivered. Tests shall be conducted, using simulated inputs and suitable instrumentation to verify that the equipment complies with the requirements of this specification. Production tests shall consist of all the tests deemed necessary by the Government to determine compliance with all of the requirements of this specification. The equipment shall be set up for production tests, using the calibration and alignment procedures provided in the appropriate deliverable instruction book.

4.3.7 Reliability and maintainability testing.

4.3.7.1 Reliability demonstration test.- The first five (5) LCDA assemblies or ten (10) LCDA simplexes shall be tested simultaneously in accordance with Test Plan IV of MIL-STD-781B, Test Level A-1, to determine compliance with the simplex MTBF requirement specified in 3.5. Failed simplexes shall be repaired and placed back on test as soon as possible. To show compliance with the simplex switching requirement, the simplexes of one (1) LCDA assembly shall be switched 229 times without failure. (Test shall be conducted using simulated inputs and suitable instrumentation to verify that each simplex complies with the requirements of this specification. Failure to comply with the acceptance criteria shall be cause for suspending production and delivery until a plan for corrective action is agreed on by the contractor and procurring activity.) The detailed requirements of Section 5 and notes of Section 6 of MIL-STD-781B shall apply. Simplexes used in the reliability demonstration shall be considered part of the deliverable quantity as specified in the contract.

4.3.7.2 Maintainability demonstration test.- One (1) or more LCDA assemblies shall be tested in accordance with Method 11 of MIL-STD-471, including Notice 1, to determine compliance with the requirements specified in 3.5.2. A customer risk (b) of 10% shall be used to determine the accept/reject criteria for the mean corrective maintenance time (M_{ct}). If repair is affected by replacement of a number of replaceable components such as circuit boards, then the time necessary to ascertain specifically which board, or boards, have failed, shall also be included in the total downtime entry for that maintenance task. (Test shall be conducted using simulated inputs and suitable instrumentation to verify that each simplex complies with the requirements of this specification. Failure to comply with the acceptance criteria shall be cause for suspending production and delivery until a plan for corrective action is agreed on by the contractor and procuring activity). The requirements of Section 4 of MIL-STD-471, including Notice 1, shall apply. Simplexes used in the maintainability demonstration shall be considered part of the deliverable quantity as specified in the contract.

5. Preparation for delivery.

5.1 General.- Preparation for delivery shall be in accordance with MIL-E-17555, and the level of packing and packaging shall be as specified in the procurement document.

6. Notes.

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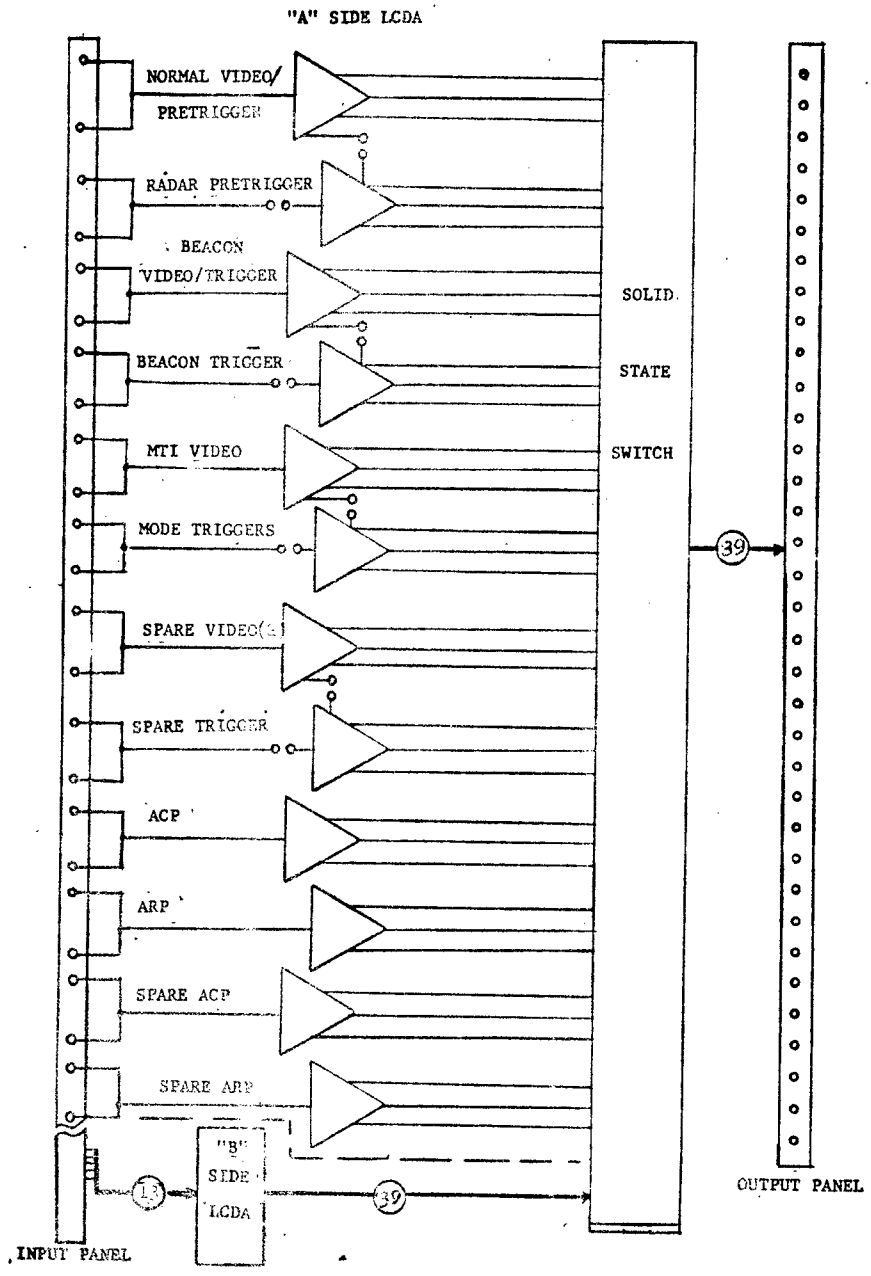
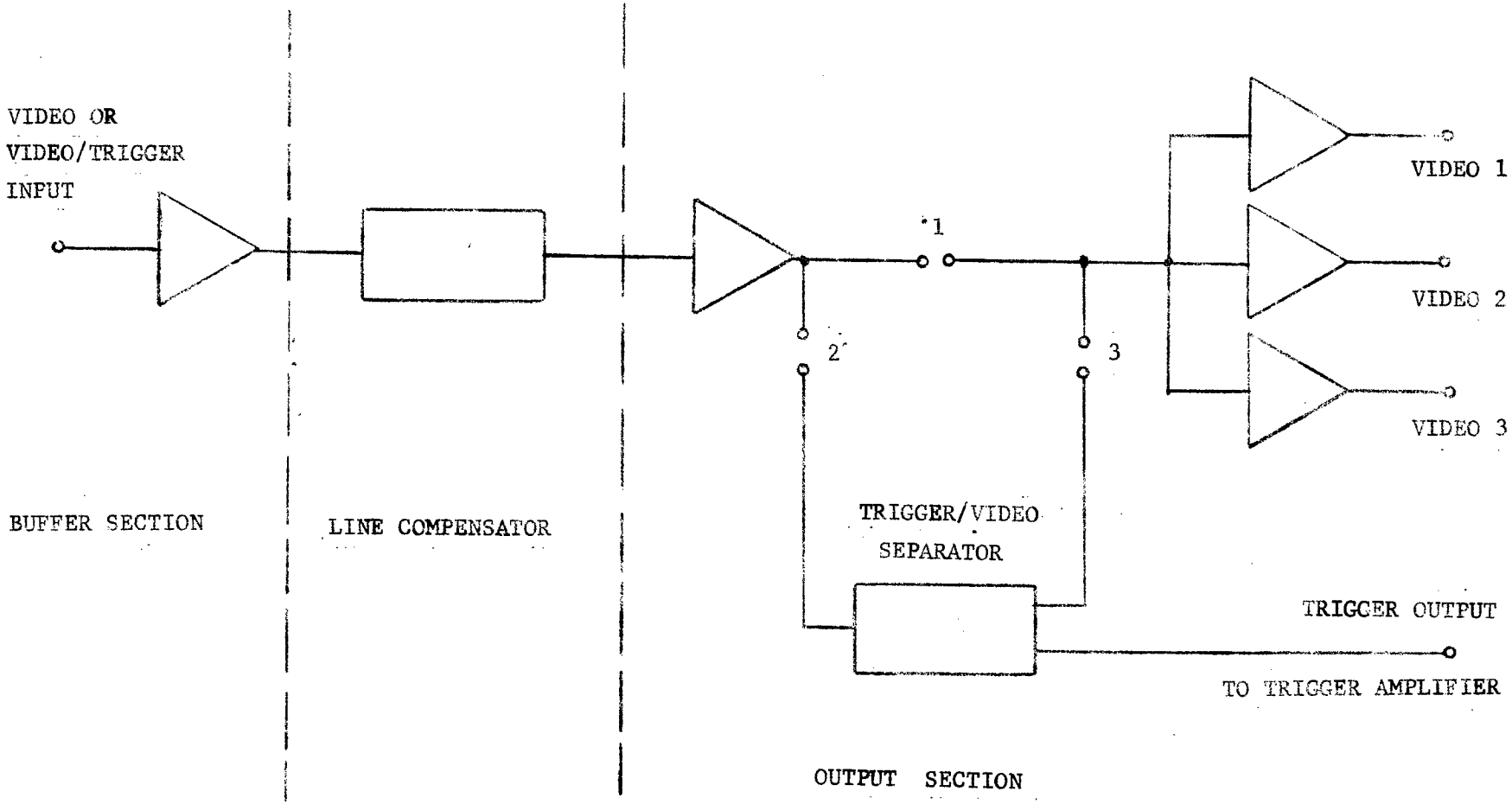


FIGURE 1. LINE COMPENSATOR/DISTRIBUTION AMPLIFIER ASSEMBLY FUNCTIONAL BLOCK DIAGRAM.



Note: Jumpers 2 and 3 strapped for mixed video/trigger input.
Jumper 1 strapped for video only input.

FIGURE 2. VIDEO AMPLIFIER FUNCTIONAL DIAGRAM.

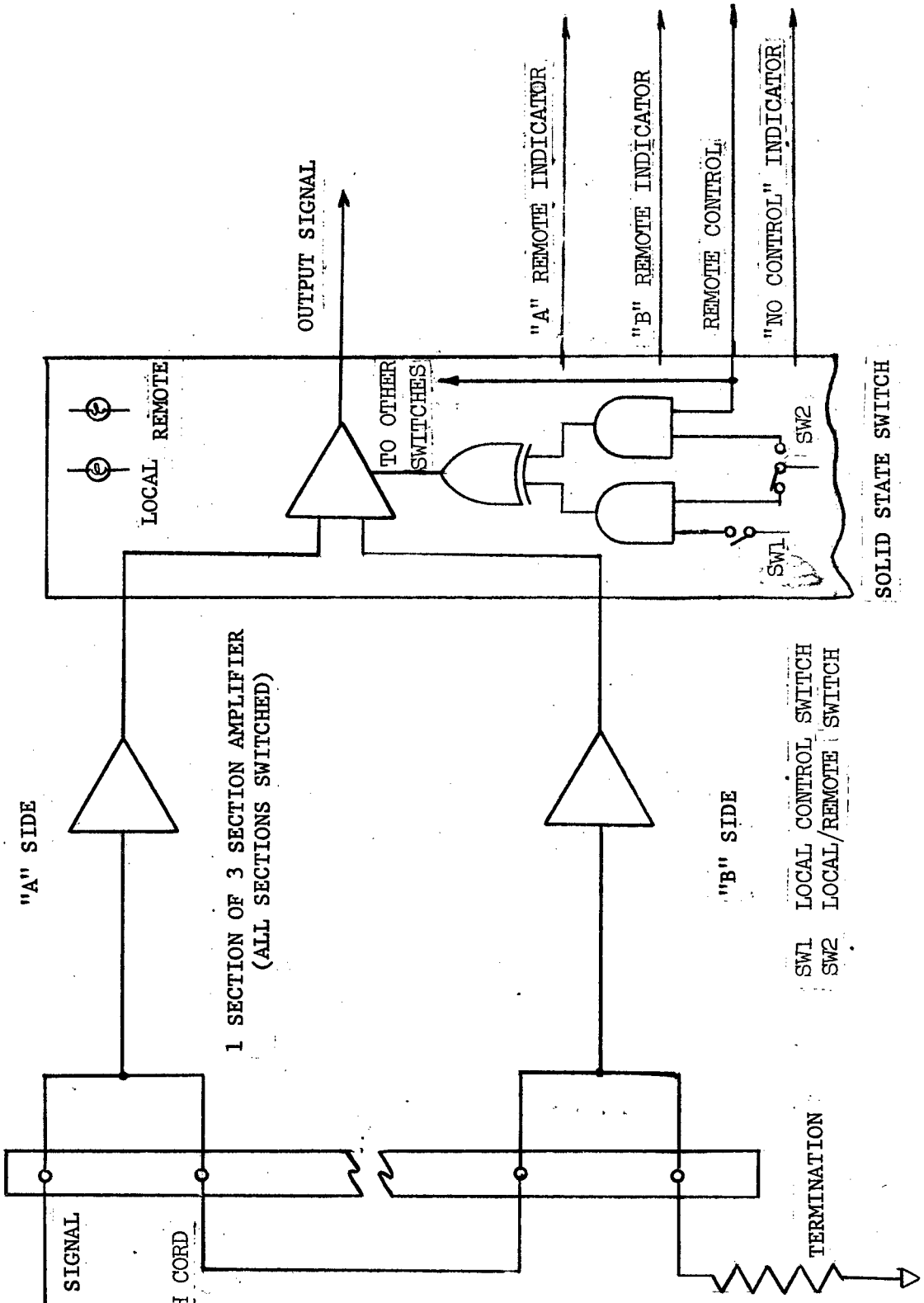


FIGURE 3. OUTPUT DATA SWITCHING FUNCTIONAL DIAGRAM.